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July 3, 1997

Via Hand Delivery

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Mr. William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street, N.W., Room 222
Washington, D.C. 20554

Re: Petition for Rulemaking (File No. 48-SAT-P/LA-97)

Dear Mr. Caton:

On behalf of our client, SkyBridge L.L.C. we hereby submit one original and four duplicate copies of a Petition for Rulemaking.

Please refer all questions and correspondence regarding this matter to the undersigned counsel.

Very truly yours,

Phillip L. Spector

Enclosures

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Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of Parts 2.106 and 25.202	)	
of the Commission's Rules to Permit	)	
Operation of NGSO FSS Systems	)	RM No. _____
Co-Frequency with GSO and	)	
Terrestrial Systems in the	)	
10.7-12.7 GHz, 12.75-13.25 GHz,	)	
13.75-14.5 GHz, and 17.3-17.8 GHz	)	
Bands, and to Establish Technical Rules	)	
Governing NGSO FSS Operations	)	
in these Bands	)	

PETITION FOR RULEMAKING

SKYBRIDGE L.L.C.

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July 3, 1997

Table of Contents

Summary

SkyBridge petitions the Commission to amend Parts 2.106 and 25.202 of its rules to permit NGSO FSS systems to operate in the U.S. co-frequency with GSO (both FSS and BSS) and terrestrial systems in the 10.7-12.7 GHz, 12.75-13.25 GHz, 13.75-14.5 GHz, and 17.3-17.8 GHz bands, and to establish technical rules governing NGSO FSS operations in these bands.

SkyBridge proposes that the Commission amend its rules to permit such operation according to the following general criteria:

(1) NGSO FSS systems operating in the subject bands will cause no noticeable degradation to the quality of service or availability of GSO and terrestrial communications links; and

(2) NGSO FSS systems operating in the subject bands will impose no operational constraints on GSO and terrestrial operators.

Changes to the Commission's Rules that would permit the SkyBridge System and other NGSO FSS systems to operate co-frequency with GSO and terrestrial systems at Ku-band are discussed in the Petition. Certain changes and clarifications to Section 2.106 and Section 25.202 of the Commission's Rules, that would allow NGSO FSS systems to operate in each of the subject bands, are proposed. The proposed status of such NGSO FSS systems with respect to GSO, terrestrial, and other NGSO systems is described. Finally, SkyBridge sets out technical criteria that should be adopted to enable the Commission and existing licensees to assess the ability of a given NGSO FSS proposal to successfully operate

in the Ku-band environment. SkyBridge proposes a set of "hard limits", designed to protect GSO FSS and BSS systems and terrestrial FS systems in the subject frequency bands.

The proposed amendments and clarifications to Section 2.106 and Section 25.202 of the Commission's Rules to permit NGSO FSS operation in the subject bands, in view of the proposed technical restrictions on such NGSO FSS systems, will not affect the existing allocations in the subject bands. NGSO FSS systems, such as the SkyBridge System, operating in accordance with the technical criteria set forth above, will cause no noticeable degradation in the quality of service or availability of GSO or terrestrial links, and will impose no additional operational restrictions on operators of such systems. So long as GSO and terrestrial licensees are fully protected from interference, there is no rational reason not to permit NGSO FSS systems to use these bands to the greatest extent possible, thereby bringing the benefit of additional communications service to the public.

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of Parts 2.106 and 25.202	)	
of the Commission's Rules to Permit	)	
Operation of NGSO FSS Systems	)	RM No. _____
Co-Frequency with GSO and	)	
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10.7-12.7 GHz, 12.75-13.25 GHz,	)	
13.75-14.5 GHz, and 17.3-17.8 GHz	)	
Bands, and to Establish Technical Rules	)	
Governing NGSO FSS Operations	)	
in these Bands	)	

PETITION FOR RULEMAKING

SkyBridge L.L.C. ("SkyBridge") hereby petitions the Commission to amend Parts 2.106 and 25.202 of its rules to permit non-geostationary orbit ("NGSO") Fixed-Satellite Service ("FSS") systems to operate in the U.S. co-frequency with geostationary orbit ("GSO") (both FSS and Broadcast-Satellite Service ("BSS")) and terrestrial systems in the 10.7-12.7 GHz, 12.75-13.25 GHz, 13.75-14.5 GHz, and 17.3-17.8 GHz bands, and to establish technical rules governing NGSO FSS operations in these bands.

The changes are proposed to facilitate licensing of a new generation of low Earth orbit ("LEO") satellite systems, which are capable of operating co-frequency with GSO and terrestrial users. One example of such a system is the "SkyBridge System," a global LEO constellation designed to provide a wide range of data, voice, and video broadband services in the FSS.[1/] The unique and innovative

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[1/] As described in Section III.A of its Application, the SkyBridge services will include, inter alia, high-speed Internet access and video-conferencing, provided (continued...)

architecture of the SkyBridge System allows it to provide continuous service, while fully protecting GSO and terrestrial systems operating at the same frequencies, thereby promoting efficient use of the limited spectrum/orbit resources.

As is discussed more fully in SkyBridge's Application (filed February 28, 1997, see File No. 48-SAT-P/LA-97), the SkyBridge System can be licensed by the Commission via a series of waivers of certain regulations identified therein. Grant of the instant petition will enable the Commission to formulate a more generic regulatory structure designed to accommodate a variety of system architectures and approaches to interference avoidance.

I. INTRODUCTION

SkyBridge requests that the Commission amend its rules to permit NGSO FSS systems to operate in the 10.7-12.7 GHz, 12.75-13.25 GHz, 13.75-14.5 GHz, and 17.3-17.8 GHz bands co-frequency with GSO and terrestrial systems operating in these bands, according to the following general criteria:

(1) NGSO FSS systems operating in the subject bands will cause no noticeable degradation to the quality of service or availability of GSO and terrestrial communications links; and

(2) NGSO FSS systems operating in the subject bands will impose no operational constraints on GSO and terrestrial operators.

1/ (...continued)
by direct reception to the general public, using small consumer receive antennas. Therefore, in addition to FSS, SkyBridge's services fit within the ITU definition of Broadcast-Satellite Service ("BSS"), although SkyBridge has no intention of providing the sort of subscription-based direct-to-home ("DTH") video services generally offered by the licensees in the Commission's Direct Broadcast Satellite ("DBS") Service. See 47 C.F.R. § 100.01, et seq.

The changes to the FCC frequency allocations and assignments, and proposed technical requirements based on these criteria, are discussed in detail below. So long as GSO and terrestrial licensees are fully protected from interference, there is no rational reason not to permit NGSO FSS systems to use these bands to the greatest extent possible, thereby bringing the benefit of additional communications service to the public.

II. PUBLIC INTEREST CONSIDERATIONS

SkyBridge proposes to provide state-of-the-art broadband services on a worldwide basis via its unique NGSO FSS system. The benefits to the public from the services that would be offered by the SkyBridge System and other NGSO systems, and the additional competition that would be provided by such systems, are self-evident.[2/] Permitting introduction of such NGSO systems will enable the Commission to enhance the level of competition in the broadband market without having to dedicate any additional spectrum resources to this end. Providing the regulatory framework for such systems represents a new paradigm for the Commission in its twenty-year effort to foster the expansion of both domestic and international satellite-based communications, which have heretofore been constrained by limited orbital and spectral resources.

The United States has been at the forefront of the development of the commercial satellite industry, both in the domestic realm[3/] and at the international

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[2/] As is described in greater detail in the Application, at Section III.A, these services include, inter alia: high-speed Internet and on-line access services, video conferencing and telephony, entertainment services such as electronic games and interactive video on demand, and a variety of substitutes for terrestrial infrastructure links.

[3/] See, e.g., Establishment of Domestic Communications-Satellite Facilities by (continued...)

level.[4/] This global leadership role has resulted in large part from the FCC's determination to encourage satellite competition whenever technically feasible,[5/] a guiding principle expressed most clearly in the Commission's "open skies" policies.[6/] Of course, the very success of these policies has led inexorably to the point at which demand for orbital slots and spectrum often exceeds supply.[7/]

The deluge of applicants for new satellite systems continues unabated, with each applicant generally seeking an exclusive orbital slot or channel assignment, depending on the nature of its proposed system. In each of these proceedings -- including, inter alia, those involving GSO Mobile-Satellite Service ("MSS") systems;[8/]

3/ (...continued)
Non-Governmental Entities, 38 F.C.C.2d 665 (1972).

4/ See, e.g., The Communications Satellite Act of 1962, Pub.L. No. 87-624, 76 Stat. 419 (1962), codified at U.S.C. §§ 701-757 (1990); Agreement on the International Telecommunications Satellite Organization (INTELSAT), done on Aug. 20, 1971, entered into force Feb. 12, 1973, T.I.A.S. No. 7532, 23 U.S.T. 3813; Communications Satellite Corp., 56 F.C.C.2d 1101 (1975).

5/ See, e.g., Satellite Business Systems, 62 F.C.C.2d 997 (1977), recon. denied, 64 F.C.C.2d 872 (1977), aff'd sub nom. United States v. FCC, 652 F.2d 72 (D.C.Cir. 1980) (en banc); Establishment of Satellite Systems Providing International Communications (Separate Systems), 101 F.C.C.2d 1046 (1985), recon., 61 R.R. 2d 649 (1986), further recon., 1 F.C.C.Rcd. 439 (1986).

6/ See Establishment of Domestic Communications Satellites by Non-Governmental Entities, supra, 38 F.C.C.2d 665.

7/ In the mid-1980s, the FCC responded to this dilemma by, inter alia, adopting a 2° orbital spacing policy, see Licensing of Space Stations in the Domestic Fixed-Satellite Service and Related Revisions of Part 25 of the Rules and Regulations, 54 Rad. Reg.2d 577 (1983), and tightening the financial qualifications requirements that GSO FSS applicants would have to meet, in order to ensure that valuable orbital/spectral resources are not awarded to applicants with no reasonable prospect of being able to construct their proposed facilities. See, e.g., National Exchange Satellite, Inc., 3 F.C.C.Rcd. 6992 (1988).

8/ Amendments of Parts 2, 22 and 25 of the Commission's Rules to Allocate (continued...)

"big" and "little" LEO NGSO MSS systems;[9/] GSO FSS, NGSO FSS, and terrestrial systems at 28 GHz[10/] -- the Commission has had to confront circumstances in which demand for spectrum/orbit resources has exceeded supply.

SkyBridge's proposal represents a dramatic break from this pattern. Put simply, an exclusive grant of spectrum is not required to support this competitive, state-of-the-art satellite system. Through careful system design -- and without extraordinary expense or complexity -- SkyBridge's NGSO system can share scarce spectrum resources with GSO and terrestrial licensees and not pose any threat of interference to their systems.

In sum, this petition affords the Commission the opportunity to chart the course for an entirely new generation of satellite systems -- systems that do not require an exclusive reservation of scarce spectrum resources and systems which can utilize the space beyond the geostationary-satellite orbit. The public interest would be

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8/ (...continued)
Spectrum for and to Establish Other Rules and Policies Pertaining to the Mobile Satellite Service for the Provision of Various Common Carrier Services, 4 F.C.C.Rcd. 6029 (1989).

9/ Application of Orbcomm for Authority to Construct, Launch, and Operate a Non-Voice, Non-Geostationary Mobile-Satellite System, 9 F.C.C.Rcd. 6476 (1994), recon. 10 F.C.C.Rcd. 7801 (1995); Application of Starsys for Authority to Construct, Launch, and Operate a Non-Voice, Non-Geostationary Mobile-Satellite System, 11 F.C.C.Rcd. 1237 (1995), Application of VITA for Authority to Construct, Launch, and Operate a Non-Voice, Non-Geostationary Mobile-Satellite System, 11 F.C.C.Rcd. 1358 (1995); Amendment of Part 25 of the Commission's Rules to Establish Rules and Policies Pertaining to the Second Pressing Round of the Non-Voice, Non-Geostationary Mobile Satellite Service, Notice of Proposed Rulemaking in I.B. Docket No. 96-220, FCC 96-426 (released Oct. 29, 1996).

10/ Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Service, Report and Order in Docket No. 92-297, FCC 96-311 (released July 22, 1996).

greatly served by an expeditious rulemaking to permit NGSO FSS systems to operate co-frequency with GSO and terrestrial systems at Ku-band, subject to regulations which ensure protection of those systems.

III. OVERVIEW OF THE SKYBRIDGE SYSTEM

As noted supra, the instant petition is intended as a vehicle to enable the Commission to devise an appropriate licensing scheme for a potentially broad array of NGSO Ku-band systems. The following discussion focuses on various features of the SkyBridge System as an example of the scope of the issues that must be considered in fashioning an appropriate regulatory scheme.

A. SkyBridge Operation

As described in greater detail in Section IV.A of the Application, the SkyBridge System includes a constellation of 64 LEO satellites (each a "Satellite"), organized into two identical, nested, 32-Satellite sub-constellations. The SkyBridge System is designed primarily to interconnect each SkyBridge "User Terminal" with a local SkyBridge "Gateway," which in turn is connected to local servers and terrestrial broadband and narrowband networks. Each Gateway is located within a 350-km (220-mile) radius cell (a "Gateway Cell"). Each Gateway serves, via the Space Segment, the User Terminals located within its Cell. SkyBridge thus provides subscribers a high capacity "last mile" connection, via satellite, to local servers and terrestrial networks.

The traffic generated by the User Terminals is transmitted transparently by the Satellites (i.e., without any on-board processing other than amplification and frequency translation) to the Gateways, and vice versa. No inter-satellite links are used.

Each Satellite will create a maximum of 45 steerable spot-beams, each illuminating a 350-km radius cell on Earth, corresponding to a Gateway Cell.[11/] Each spot-beam remains fixed with respect to the ground as the Satellite moves, serving a given Gateway Cell, so long as the Satellite remains available to the Gateway Cell. The schedule specifying the spot-beam assigned to each Gateway at any given time is centrally pre-planned. Updated plans are transmitted periodically to the Gateways and the Satellites.

Because the Satellites are not stationary with respect to Earth, Gateway traffic must be periodically handed-over between Satellites. Handover may be required for geometrical reasons (e.g., there is another Satellite with a better elevation angle), propagation reasons (e.g., local environmental blockage), or, as described below, to prevent interference to or from GSO and terrestrial systems. The interference avoidance techniques are discussed, infra, at Section III.C.

B. SkyBridge Band Plan

The proposed worldwide band plan for the SkyBridge System is presented in Table 1 below.[12/] The SkyBridge System requires a minimum of 1.05 GHz in the Ku-band for each of uplink and downlink. In order to accommodate this requirement on a worldwide basis, taking into account the variation in allocations across various countries and regions, SkyBridge is seeking authority to operate in all

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[11/] Most of the time, no more than 6 of the 45 spot-beams will be operated at a given frequency and polarization.

[12/] The band plan presented in Figure 1 differs from the plan included in the Application. In a minor amendment to the SkyBridge Application being filed contemporaneously with this Petition (the "Amendment"), SkyBridge deleted the 14.5-14.8 GHz and 17.8-18.1 GHz bands, which are used by U.S. Government systems.

of the bands set forth in Table 1. Not all of the frequencies listed would necessarily be used in any given region or country.

	Uplink	**Downlink**
Service Links, Infrastructure Links, and TT&C Links[13/]	12.75-13.25 GHz 13.75-14.5 GHz 17.3-17.8 GHz	10.7-12.75 GHz (10.7-12.7 GHz in ITU Region 2)

Table 1: Revised SkyBridge Worldwide Band Plan

The band plan is illustrated in Figure 1 below, which indicates the ITU allocations of the subject bands. The current ITU and U.S. allocations corresponding to these bands are discussed in detail in Section V.C of the Application.

13/ The SkyBridge Service Links, Infrastructure Links, and TT&C Links are defined and described in Section IV.A.1 of the Application.

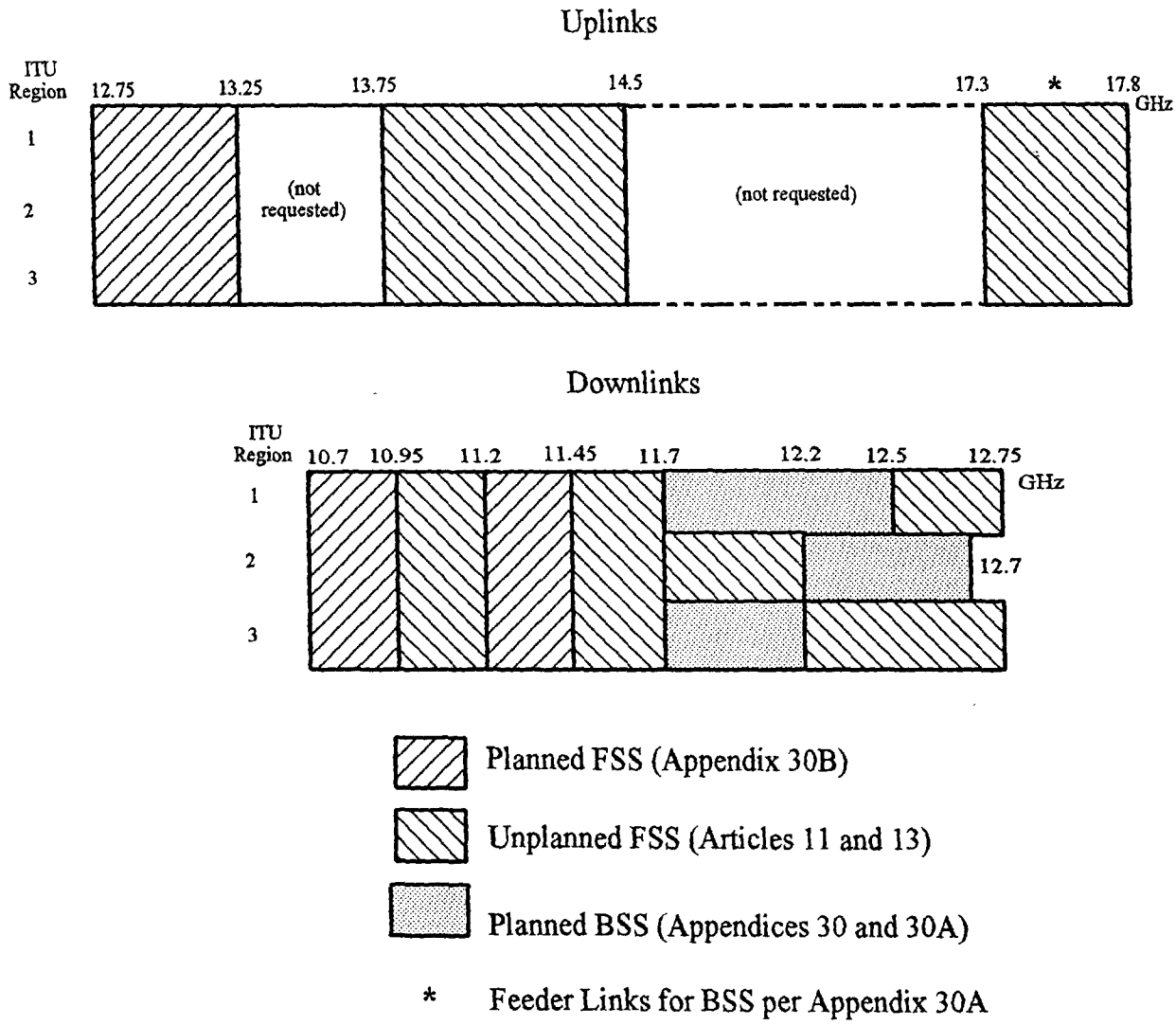

Figure 1: SkyBridge Band Plan with ITU Frequency Allocations

As discussed in the Application, the ITU Radio Regulations currently restrict operation of NGSO satellites in certain of these bands.[14/] SkyBridge anticipates that the relevant ITU restrictions will be removed prior to SkyBridge's scheduled initial launch dates in 2001. The Commission can and should begin now to

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[14/] The 10.7-10.95 GHz, 11.2-11.45 GHz, and 12.75-13.25 GHz bands are part of the ITU planned FSS bands, and are subject to Appendix 30B, which currently does not permit operation of NGSO satellites in these bands. In Region 2, the 12.2-12.7 GHz band is governed by Appendix 30 (Broadcast-Satellite Service Plan), and is subject to Resolution 506, which also precludes NGSO operation. The 10.95-11.2 GHz, 11.45-11.7 GHz, 11.7-12.2 GHz (in Region 2), and 13.75-14.5 GHz bands are in the unplanned FSS, and are subject to S22.2, which does not specifically preclude NGSO operations.

establish a domestic regulatory scheme that can accommodate NGSO/GSO/FS sharing at Ku-band.

C. SkyBridge Interference-Avoidance Techniques

As described in detail in Section V of the Application, the SkyBridge System will utilize existing Ku-band allocations co-frequency with GSO (both FSS and BSS) and terrestrial systems.

1. GSO Systems

With regard to GSO systems, the SkyBridge System avoids interference through the simple technique of not transmitting -- either to or from a given SkyBridge Satellite -- so long as that Satellite is within a predetermined geographic zone within which such transmissions could reasonably be expected to cause interference. The "non-operating zone" extends at least $\pm 10°$ from the GSO arc as seen by any GSO earth station in a Gateway Cell. As a Satellite pointing a spot-beam on a particular Gateway Cell approaches the non-operating zone for that Cell, User Terminal and Gateway traffic will be handed over automatically by commands from the relevant Gateway earth station to a spot-beam on another Satellite located outside of the non-operating zone. The first Satellite cannot begin transmitting again to the Gateway Cell until it has exited the non-operating zone.

The SkyBridge constellation has been designed to ensure that there always will be a Satellite to which traffic can be handed any time a given Satellite approaches the non-operating zone. As discussed in detail in the Application, several safeguards ensure proper handover and non-interference with GSO and terrestrial systems. These include the following: (1) each Gateway stores the SkyBridge constellation ephemeris and a map of its Cell's non-operating zone, and uses this data

to confirm that new plans received are acceptable from an interference point of view; (2) the Satellites receive the plans, and will communicate with a Gateway only according to the plan; (3) the User Terminals will not transmit toward a SkyBridge Satellite (or anywhere else) unless receiving a signal from a Gateway via a Satellite in communication with the Gateway.

As demonstrated in Appendix C of the Amendment, the power received by a given GSO earth station or satellite from the SkyBridge System will be below the noise floor of such GSO receiver. No degradation in the quality of service or availability of these systems will be caused by SkyBridge operations, and no operational constraints will be imposed.

2. Terrestrial Systems

Several techniques are employed by SkyBridge to enable it to operate co-frequency with Fixed Service ("FS") terrestrial systems operating in the subject bands. These techniques are discussed in detail in Section V.A.2 and Appendix B of the Application, and further in Section IV of the Amendment.

(a) User Terminals

SkyBridge does not propose to operate its User Terminals at frequencies heavily used by terrestrial operations in the U.S.[15/] Therefore, the ubiquitous User Terminals generally need not be coordinated with terrestrial systems.

15/ See Figure 3 in the Amendment, which shows a possible frequency usage plan. According to this plan, the 12.7-12.75 GHz and 12.75-13.25 GHz bands used in the U.S. by, e.g., the Cable Television Relay Service ("CARS") will not be used by User Terminals. This is also the case for the 10.7-11.7 GHz band, which is used in the U.S. for, e.g., the Private Operational Fixed Point-to-Point Microwave Services, Local TV Transmission Services, and Broadcast Auxiliary Services.

(b) Gateways

As described in Section IV.A.2 of the Application, SkyBridge will operate only one Gateway in each 350-km (220-mile) radius Gateway Cell. A total of about 30 Gateways will be operated throughout the continental United States. Each Gateway will be sited and operated according to existing coordination techniques.[16/] Additionally, Gateways often will employ a frequency plan that will avoid particular FS channels altogether.

The use of such traditional coordination measures will not be burdensome to either SkyBridge or to FS operators, as discussed in Section IV of the Amendment. There should be no significant reduction in the ability of existing FS operators to add new links to their systems.

(c) Satellites

The power flux density from the SkyBridge Satellites will meet the criteria of Section 25.208(b) of the Commission's rules at all times. Because the Satellites are moving with respect to terrestrial facilities, most of the time the power received by terrestrial stations will be even further below that permitted under this criteria. As demonstrated in Appendix C of the Amendment, the power received by FS receivers from the SkyBridge Satellites will always be below the noise floor of such receivers.

As a result of these interference-avoidance techniques, no noticeable degradation to the quality of service or availability of terrestrial systems will be

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16/ See, e.g., Section 25.203 of the Commission's rules and Appendix 28 of the ITU Radio Regulations.

caused by the SkyBridge System, and no operational constraints will be imposed on such systems.

IV. PROPOSED RULES

The FCC rule changes required to permit NGSO systems to operate co-frequency with GSO and terrestrial systems at Ku-band are discussed below.

A. Spectrum Allocations and Assignments

The following changes and clarifications to the United States Table of Frequency Allocations, Section 2.106 of the Commission's Rules (the "U.S. Table"), and Section 25.202 of the Commission's Rules, are required to allow NGSO FSS systems, such as the SkyBridge System, to operate in each of the subject bands.

The **12.75-13.25 GHz** band is allocated to FSS (Earth-to-space) in the U.S. Table, but is not assigned to FSS in Section 25.202. SkyBridge hereby petitions the Commission to amend Section 25.202 to assign the 12.75-13.25 GHz band to FSS (Earth-to-space), for use by NGSO FSS systems subject to technical rules that assure protection for GSO and terrestrial systems permitted to operate in this band.

The **17.3-17.8 GHz** band is allocated internationally for FSS (Earth-to-space), but is not so allocated in the U.S. Table (and is not assigned to FSS in Part 25). SkyBridge hereby petitions the Commission to amend Section 2.106 and Section 25.202 to allocate the 17.3-17.8 GHz band to FSS (Earth-to-space), for use by NGSO FSS systems co-frequency with GSO (including BSS) and terrestrial operations in this band, consistent with the ITU allocations.

The **10.7-10.95 GHz** and **11.2-11.45 GHz** bands are allocated to (and appear to be assigned to) FSS (space-to-Earth) in the U.S. Table, but are not assigned to FSS in Section 25.202. SkyBridge hereby petitions the Commission to amend

Section 25.202 to assign the 10.7-10.95 GHz and 11.2-11.45 GHz bands to FSS (space-to-Earth), for use by NGSO FSS systems co-frequency with GSO and terrestrial operations in these bands.

It appears that no changes to either Section 2.106 or Section 25.202 are required to permit licensing of NGSO FSS systems in the **11.7-12.2 GHz** band, so long as such systems operate subject to technical limits that ensure protection to GSO and terrestrial systems operating in the band. This band currently is limited, with respect to FSS systems, to national and subregional systems by prior agreement between the administrations concerned.[17/] SkyBridge, which provides "last-mile" services, may properly be considered to be a "national" system. Furthermore, pursuant to footnote NG143 in the U.S. Table, protection is afforded to systems not in conformance with this restriction if the system imposes no unacceptable constraints on operations or orbit locations of space stations operating in accordance with this restriction.

No changes to Section 2.106 or Section 25.202 are required to permit NGSO FSS operations in the **13.75-14.5 GHz** band. Systems operating in the 13.75-13.80 GHz sub-band must coordinate on a case-by-case basis with the Tracking and Data Relay Satellite System ("TDRSS").[18/] In addition, FSS earth stations in the 13.75-14.0 GHz sub-band are subject to EIRP and antenna diameter limitations.[19/]

17/ See footnote S5.488 of the ITU Radio Regulations and footnote 839 of the U.S. Table.

18/ See U.S. Table footnote US337. As described in the Application and the Amendment, SkyBridge has the inherent flexibility to achieve this coordination without any constraints on the TDRSS program, and is not requesting any relaxation or waiver of that rule.

19/ See ITU (and U.S. Table) footnote S5.502. SkyBridge will meet these

(continued...)

NGSO systems should be able to comply with these requirements without substantial difficulty.

It also appears that no changes to the FCC rules are required to permit licensing of NGSO FSS systems in the **12.2-12.7 GHz** band. The U.S. Table does not include ITU footnote S5.492, which permits FSS downlink operation in this BSS band if "such transmissions do not cause more interference or require more protection from interference than the [BSS] transmissions operation in conformity with the Region 2 Plan." However, the U.S. Table does provide, in footnote NG139, that, pending adoption of further specific rules, FSS may be authorized in this band "subject to the condition that adjustments in certain system design or technical parameters may become necessary during the systems' lifetime" depending upon the Final Acts of RARC-83 and subsequent Commission decisions. Because the SkyBridge System will not interfere with BSS operations in this band, there appears to be no rational reason why an NGSO FSS system with the sharing capability of the SkyBridge System could not be licensed in this band without any changes to the rules. SkyBridge hereby petitions the Commission to clarify that NGSO FSS systems can be licensed in the 12.2-12.7 GHz band, provided that such systems do not cause interference to BSS systems operating in the band.

Certain of the bands listed in Table 1 are subject to footnote NG104 of the U.S. Table,[20/] which limits use of these bands by the FSS to "international systems, i.e., other than domestic systems." The status of this requirement is not

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19/ (...continued)
requirements, and is not requesting any modification or waiver of this rule.

20/ According to the U.S. Table, the 10.7-11.7 GHz and 12.75-13.25 GHz bands are subject to this footnote. However, Section 25.202(a)(1) indicates that only the 11.45-11.7 GHz band is subject to this restriction.

clear in the light of the so-called "DISCO I" rulemaking, which generally removed the distinction between international and domestic satellite systems.[21/] However, to the extent that the footnote may continue to have some force, SkyBridge hereby petitions the Commission to amend and/or clarify footnote NG104 to permit, in the subject bands, global NGSO FSS systems providing service that, prior to DISCO I, would have been classified as "domestic" service.

Finally, as noted above, the ITU Radio Regulations currently restrict operation of NGSO satellites in certain of the subject bands, limitations that SkyBridge anticipates will be removed by action taken at WRC-97 and/or WRC-99. The FCC rules, by their terms, do not appear to contain such a restriction. However, SkyBridge petitions the Commission to clarify that the FCC rules permit operation of NGSO systems in the subject bands, at least to the extent permissible under the relevant ITU rules.

B. Status of NGSO Systems With Respect to GSO, Terrestrial, and NGSO Systems

1. Status with Respect to GSO Systems

FSS NGSO systems proposing to operate in the Ku-band should be required to avoid interference to all current and future GSO systems operating according to ITU and FCC rules.

21/ The DISCO I order eliminated the distinction between U.S. domestic fixed satellites ("domsats") and "separate systems" (U.S.-licensed international satellites separate from Intelsat) and allowed both groups to provide both domestic and international services. Amendment to the Commission's Regulatory Policies Governing Domestic Fixed Satellites and Separate International Satellite Systems, 11 FCC Rcd 2429 (1996) ("DISCO I").

2. Status with Respect to Terrestrial Systems

FSS NGSO systems proposing to operate in the Ku-band should be required to avoid use of end-user earth stations in Ku-band frequencies heavily used by FS systems. Operators of NGSO FSS systems should be required to coordinate gateway facilities according to standard coordination techniques to avoid interference to current terrestrial operations. With respect to coordination with terrestrial links constructed subsequent to the siting of such a gateway facility, the burden should be shared, with both the NGSO operator and the terrestrial operator mutually obligated to employ reasonable interference avoidance techniques.

3. Status with Respect to NGSO Systems

FSS NGSO systems proposing to operate in the Ku-band should be required to operate on a non-interference basis with respect to any existing FSS NGSO systems operating in the subject bands.

C. Technical Rules

Below, SkyBridge sets out technical criteria that should be adopted to enable the Commission and existing licensees to assess the ability of a given NGSO proposal to successfully operate in the Ku-band environment. In general, such criteria ensure that:

(1) NGSO FSS systems operating in the subject bands will cause no noticeable degradation to the quality of service or availability of GSO and terrestrial communications links; and

(2) NGSO FSS systems operating in the subject bands will impose no operational constraints on GSO and terrestrial systems.

Protection of GSO FSS and BSS systems and terrestrial FS systems in the subject frequency bands can be ensured by establishing "hard limits" (i.e., limits not to be exceeded under any circumstances) on NGSO FSS operations in the bands. SkyBridge proposes one set of such limits, based on:

- for the downlink, the "equivalent" power flux-density ("e.p.f.d") computed taking into account all visible NGSO satellites, as well as the p.f.d. from an NGSO satellite, and
- for the uplink, the "aggregate" power flux-density ("a.p.f.d.") computed taking into account all visible NGSO earth stations.

1. Downlink - e.p.f.d. and p.f.d. Limits

The e.p.f.d. is defined as the sum of the power flux-densities produced at a point on the Earth's surface by all space stations within a NGSO system, taking into account the off-axis discrimination of a reference GSO receiving antenna assumed to be pointing towards the GSO. The e.p.f.d. is calculated using the following formula:

$$\text{e.p.f.d.} = 10 \cdot \log_{10}\left[\sum_{i=1}^{N} \text{p.f.d.}_i \cdot G_r(\theta_i) / G_{r,max} \right]$$

where:

- e.p.f.d. is the equivalent power flux-density received by the GSO earth station, radiated from the NGSO space stations (in dB(W/m^2/4kHz) for FSS bands and dB(W/m^2/27MHz) for BSS bands);
- N is the number of NGSO space stations in view of the GSO earth station operating co-frequency with the GSO carrier;
- i is an index ranging from 1 to N, representing each of the NGSO space stations;
- p.f.d.$_i$ is the p.f.d. radiated by the ith NGSO space station in the direction of the GSO earth station (in W/m^2/4kHz for FSS bands and W/m^2/27MHz for BSS bands);
- θ_i is the off-axis angle between the boresight of the receive antenna of the GSO earth station and the direction of the ith NGSO space station;

- $G_r(\theta_i)$ is the receive antenna gain of the GSO earth station in the direction of the i^{th} NGSO space station; and
- $G_{r,max}$ is the maximum receive antenna gain of the GSO earth station.

In the FSS bands (both planned and unplanned), the proposed e.p.f.d. limits are as follows:

Frequency Bands	**e.p.f.d. dB(W/m^2)**	**Percentage of time level cannot be exceeded**	**Antenna**	**Reference Bandwidth (kHz)**
10.7-11.7 GHz 11.7-12.2 GHz in Region 2 12.2-12.5 GHz in Region 3 12.5-12.75 GHz in Region 3 12.5-12.75 GHz in Region 3	**-179**	**99.7%**	60 cm, ITU-R Rec 465-5	4
	-192	**99.9%**	3 m, ITU-R Rec 465-5	4
	-185	**99.97%**	10 m, ITU-R Rec 465-5	4
	-170	**100%**	60 cm, 3 m and 10 m, ITU-R Rec 465-5	4

Table 2: e.p.f.d. Limits for FSS Bands